Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

I SEMESTER B.S. DEGREE EXAMINATION – APRIL / MAY 2017

SUBJECT: ENGINEERING STATICS AND DYNAMICS (CE 111)

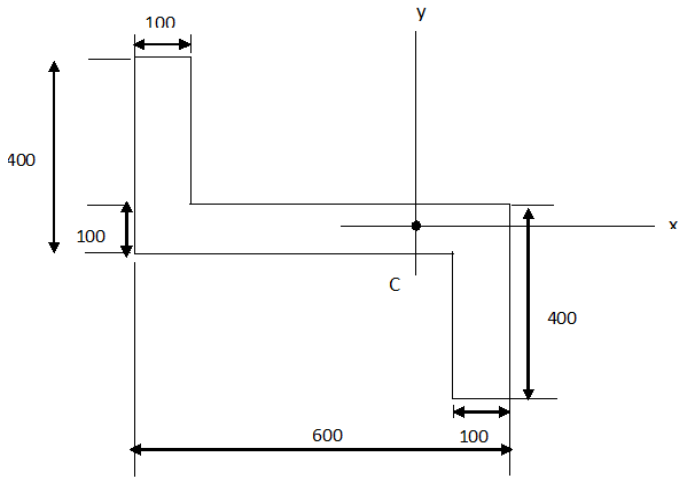
(BRANCH: COMMON TO ALL)

Wednesday, 10 May 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer FIVE full questions**
- ✓ **Assume missing data, if any, suitably and indicate them clearly**

1A. Determine the moments of inertia of the beam's cross-sectional area shown in Fig.1a about the *x* and *y* centroidal axes.



All the dimensions are in mm

Fig.**1a**

1B. Find the MI of semicircular area about its horizontal centroidal axis **(12+8)**

2A. Determine the force P required to start the wedge shown in Fig. 2a. The angle of friction for all surfaces in contact is 15°.

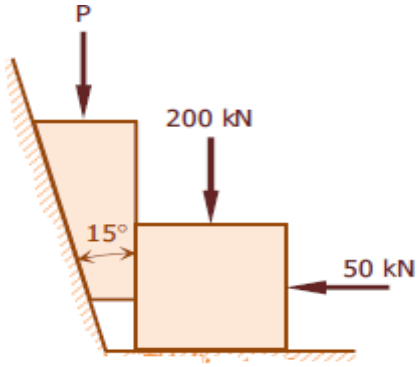


Fig. 2a

2B. A flexible cable which supports a load of 981 N is passed over a fixed circular drum and subjected to a force **P** to maintain equilibrium as shown in Fig.2b. Coefficient of friction between the cable and the drum is 0.30. For $\alpha = 0$, determine the maximum and minimum value of **P** which may have to be applied in order not to raise or lower the load.

(12+8)

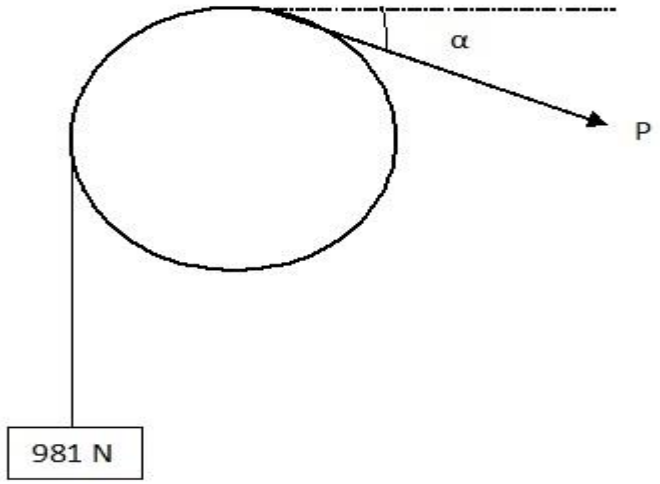


Fig. 2b

3A. State and explain basic idealization in engineering mechanics.

3B. If the resultant of the two forces shown in Fig.3b is 700N directed vertically upwards, find the angles α and β using rectangular components.

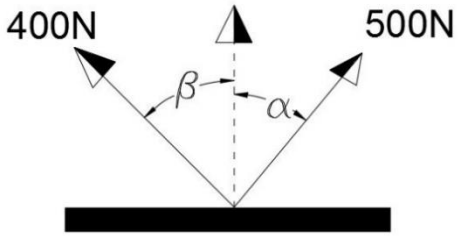


Fig. 3b

3C. Locate the centroid of the shaded area w.r.t. to the axes shown in the Fig.3c **(4+6+10)**

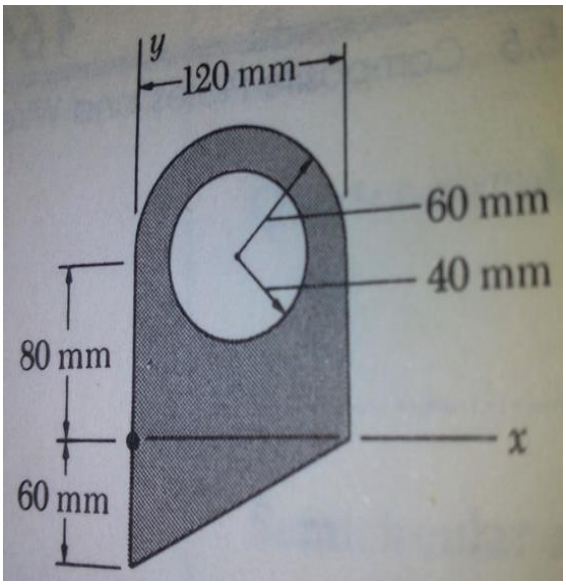


Fig.3c

4A. A roller of mass 200kg kept on a smooth plane is supported by a cable as shown in Fig.4a. Determine the tension in the cable.

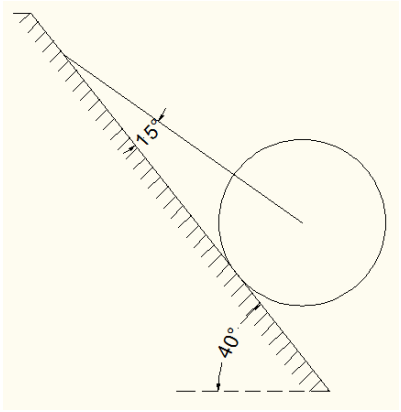


Fig.4a

4B. Find the resultant of the non-concurrent force system shown in Fig.4b and locate it with respect to the point A.

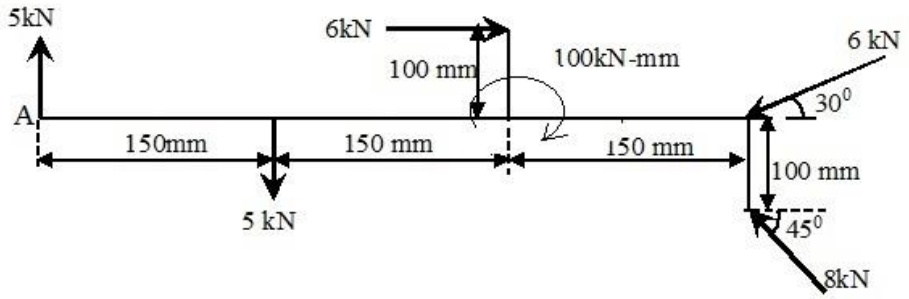


Fig.4b

4C. Determine the reactions developed in the double overhanging beam shown in Fig.4c**.**

(4+8+8)

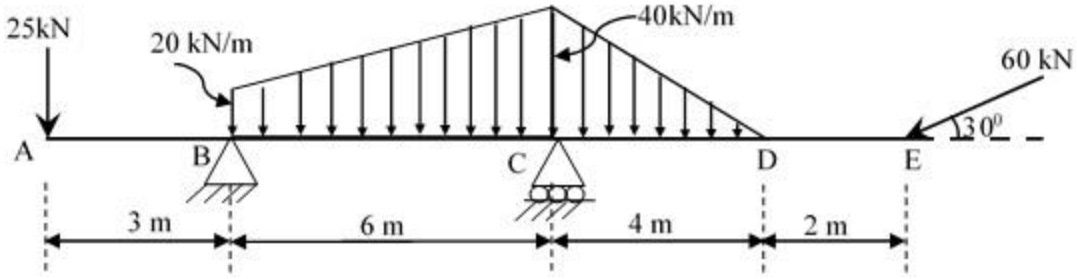


Fig.4c

5A Define : i) Momentum ii) Impulse of a force

5B. Derive the relationship between Impulse – momentum

5C. An army truck of mass 5 tonnes has a tractive resistance of 150N/t. Find the power required to propel the truck at a uniformm speed of 36kmph.

i) Up an incline of 36kmph

ii) On a level track

iii) Down an incline of 1 in 100

(2+3+15)

6. A ball of mass 2 kg, moving with a velocity of 3m/s, impinges on a ball of mass 4 kg moving with a velocity of 1m/s. The velocities of two balls are parallel and inclined at 30^0 to the line joining their centres at the instant of impact. If the coefficient of restitution be 0.5, find
   a) Direction in which the 4 kg ball will move after impact.
   b) Velocity of the 4 kg ball after impact.
   c) Direction in which 2 kg ball will move after impact.
   d) Velocity of the 2 kg ball after impact.

(20)

7A. Two electric trains A and B leave the same station on parallel lines. The train A starts from rest with a uniform acceleration of 0.2 m/s2 and attains a speed of 45 kmph, which is maintained constant afterwards. The train B leaves 1 minute after with a uniform acceleration of 0.4 m/s2 to attain a maximum speed of 72 kmph, which is maintained constant afterwards. When will the train B overtake the train A ?

7B. Determine the banking angle for the race track so that the wheels of the racing cars shown in Fig.7b. will not have to depend upon friction to prevent any car from sliding up or down the track. Assume the cars have negligible size, a mass m, and travel around the curve of radius r with a constant speed

Fig.7b

7C. The 100-kg block ‘A’ shown in Fig. 7c is released from rest. If the masses of the pulleys and the cord are neglected, determine the speed of the 20-kg block B in 2 s **(8+4+8)**

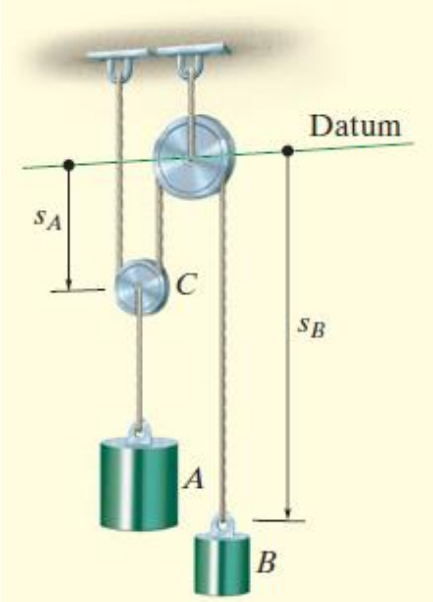


Fig. 7c

8A. Find the forces in the members AB, AD, EF and CD of truss as shown in Fig. 8a. by method of sections

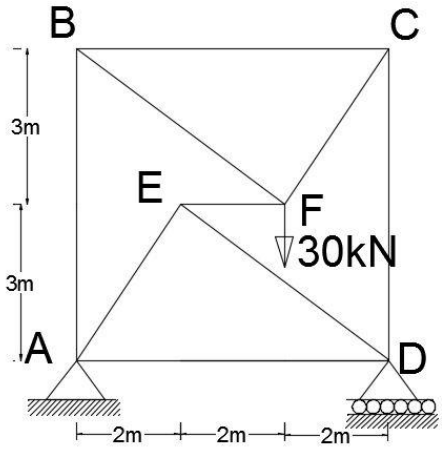


Fig. 8a

8B. Explain statically determinate and statically indeterminate trusses.

(16+4)